PROPERTY PLANNING COMMON ELEMENTS

COMPONENTS OF MASTER PLANS

HABITATS AND THEIR MANAGEMENT

Lakes

Description

This page provides an overview of inland lakes, naturally occurring bodies of water that exhibit a great diversity in size, configuration, water chemistry, and biota. A wide range of factors, including glaciation, post-glacial water flow, soil characteristics, topography, bedrock composition, land cover, and land use, can combine to determine the physical and chemical characteristics of any given lake.

The Wisconsin Wildlife Action Plan has divided inland lakes into multiple types using the following four characteristics: size; water depth; alkalinity; and water source. These are described below.

Size, Small or Large*:* Small lakes typically are less than 10 acres and large lakes are greater than 10 acres.

Water Depth, Deep or Shallow*:* Water depth is one characteristic that influences stratification, or the variations in temperature at different depths of a lake throughout the season. Various other factors also influence stratification, including surface area, water source, and water clarity. In stratified lakes (typically deeper lakes), a thermocline develops in summer and winter. In spring and fall, this zone of marked temperature differences breaks down. Bottom and surface waters mix, and oxygen and nutrients are redistributed. Lakes that don't stratify thermally (typically shallow lakes) can become oxygen-depleted as water warms and decomposition exceeds primary production. This can also occur in the winter when ice and snow cover the surface and inhibit photosynthesis, causing "freezeout" conditions. In this classification, deep lakes (and their associated plant and fish species) are those greater than 18 feet in depth, and shallow lakes are those less than 18 feet in depth.

Alkalinity, Hard or Soft*:* Hard water lakes are those with total alkalinity equal to or greater than 50 parts per million (ppm). These lakes are less susceptible to acidification due to high concentrations of hydroxyl, carbonate, and/or bicarbonate ions, which buffer acids. Soft water lakes have a total alkalinity less than 50 ppm, and have a low capacity to buffer acids.

Water Source, Drainage or Seepage or Spring*:* **Drainage** lakes have both an inlet and an outlet and their main water source is from streams. Most of Wisconsin's major rivers have drainage lakes along their course. Drainage lakes that obtain half their maximum depth from a dam are considered artificial lakes or impoundments (see "Impoundments and Flowages" Common Element). **Seepage** lakes are landlocked waterbodies with no inlet or outlet. Their main source of water is precipitation or runoff, supplemented by groundwater from the immediate drainage area. Because of this, water levels in seepage lakes may fluctuate seasonally. Seepage lakes are the most common lake type in Wisconsin. **Spring** lakes have an outlet, but no inlet. Their primary source of water is groundwater flowing into the bottom of the lake from inside and outside the immediate drainage area. Spring lakes are the headwaters of many streams, and are fairly common in northern Wisconsin.

These four major characteristics can be combined to describe multiple lake types (e.g., "Large lake, shallow, hard, seepage", or "Large lake, deep, soft, drainage"). To read more detailed descriptions of different lake types, visit

the Aquatic communities page and click on "Inland lakes (group)" under "Explore aquatic communities" or on an individual lake type under "Explore inland lake types".

Plant communities associated with inland lakes fall into two general categories: submergent marsh and floating-leaved aquatic. Both communities can be found within a single lake. In general, submergent species tend to occur in deeper water than floating-leaved species, although there is considerable overlap. Many factors influence the type and abundance of aquatic plants present in a given lake, including water clarity, chemistry, substrate, and stratification. Of these, water chemistry is perhaps the most important. To learn more about these different aquatic plant communities, see the "Emergent Wetland and Shallow Lake/Deep Marsh" Common Element.

Ecological Landscape Opportunities

To learn more about Ecological Landscape opportunities for inland lakes, visit the Aquatic communities page and click on an inland lake type under "Explore inland lake types".

Rare Species

Many Species of Greatest Conservation Need (SGCN) are associated with inland lakes based on the findings in Wisconsin's 2015 Wildlife Action Plan. To learn more, visit the Aquatic communities page and click on an inland lake type under "Explore inland lake types".

Threats

- Runoff carrying sediments, nutrients, bacteria, or contaminants from agricultural areas, construction sites, or residential, urban, or industrial areas (particularly when these developed areas occur on the shorelines of lakes) washes into lakes, negatively impacting their water quality and associated plant and animal communities.
- Invasive species are a significant threat to lakes. Early and abundant growth of invasive plants can overwhelm native plants, disrupt predator-prey relationships, and limit important aquatic food plants for waterfowl. Die-off and decay of these plants in summer can cause oxygen depletion and contribute to nutrient loading and algal blooms. Non-native animals outcompete their native counterparts, destroy beds of aquatic plants, and impact water quality and clarity. Especially problematic species include Eurasian water-milfoil, curly-leaf pondweed, common carp, rusty crayfish, and non-native mussels.
- Alteration of stream hydrology through installation of dams, other water control structures, channelization, or excessive groundwater withdrawals can impact lakes by disrupting natural hydrologic fluctuations integral to aquatic ecosystems and associated wetlands, fragmenting habitat, and preventing movements of some species.
- Altered temperature and precipitation patterns associated with climate change may affect lakes by changing hydrology, water levels, and water chemistry, facilitating invasion by non-native invasive species, and increasing runoff.

Management Techniques

- Passive management
- Pesticide treatments

- Lake aeration
- Nearshore practices

Management Prescriptions

- Wherever possible, manage lakes as part of a complex of interconnected, related habitats (e.g., open, shrub, or forested wetlands, upland forests, etc.).
- Maintain site hydrology; restore where appropriate and feasible.
- Attempt to prevent the spread of non-native invasive species into lakes where they currently do not occur. Employ chemical and mechanical methods to control them where they are present.
- Where possible, use buffers to protect lakes from negative impacts of surrounding land uses (e.g., sedimentation, pollution).
- Consider potential impacts on lakes when conducting management in adjacent areas, including impacts on groundwater recharge areas, springs, inlet/outlet streams, etc.